

CLAIMS

1. A gas turbine engine afterburner comprising:
an exhaust duct having a fixed area outer nozzle at an aft end thereof;
an ablative inner nozzle lining said outer nozzle;
a flameholder mounted inside a forward end of said duct; and
a fuel injector disposed in said flameholder for injecting fuel therein.
2. An afterburner according to claim 1 wherein said flameholder comprises a plurality of flameholding gutters extending radially outwardly from a center cup to a surrounding liner.
3. An afterburner according to claim 2 wherein said liner terminates upstream from said outer nozzle to define a combustion chamber extending inside said liner and downstream therefrom inside said exhaust duct to define a linerless portion thereof.
4. An afterburner according to claim 3 wherein said linerless duct portion is coated inside with a thermal barrier coating.
5. An afterburner according to claim 4 wherein:
said outer nozzle has an axial contour converging aft to an outer throat of minimum flow area and diverging aft to a nozzle outlet at an aft end of said outer nozzle; and
said inner nozzle has an axial contour converging aft to an inner throat smaller than said outlet throat and diverging aft to said nozzle outlet.
6. An afterburner according to claim 5 wherein said flameholder liner includes a pattern of screech suppression holes therein.
7. An afterburner according to claim 6 wherein said flameholder liner is spaced inwardly from said duct to define a slot for channeling cooling air therethrough for cooling said liner and film cooling said linerless duct portion downstream therefrom.

8. An afterburner according to claim 7 wherein said center cup includes a center aperture receiving said fuel injector therein, and a plurality of surrounding slots for swirling engine exhaust therethrough.
9. An afterburner according to claim 8 further comprising a plurality of fuel injection spray bars distributed between said flameholder gutters.
10. An afterburner according to claim 9 wherein said ablative inner nozzle comprises a combustible material.
11. A gas turbine engine afterburner comprising:
an exhaust duct having a fixed area outer nozzle at an aft end thereof; and
an ablative inner nozzle lining said outer nozzle.
12. An afterburner according to claim 11 wherein:
said outer nozzle has an axial contour converging aft to an outer throat of minimum flow area and diverging aft to a nozzle outlet at an aft end of said outer nozzle; and
said inner nozzle has an axial contour converging aft to an inner throat smaller than said outlet throat and diverging aft to said nozzle outlet.
13. An afterburner according to claim 12 wherein said ablative inner nozzle comprises a combustible material.
14. An afterburner according to claim 12 further comprising:
a flameholder mounted inside a forward end of said duct; and
a fuel injector disposed in said flameholder for injecting fuel therein.
15. An afterburner according to claim 14 wherein said flameholder comprises a plurality of flameholding gutters extending radially outwardly from a center cup to a surrounding liner.

16. An afterburner according to claim 15 wherein said liner terminates upstream from said outer nozzle to define a combustion chamber extending in minor part inside said liner and in major part downstream therefrom inside said exhaust duct to define a linerless portion thereof.
17. An afterburner according to claim 16 wherein said linerless duct portion is coated inside with a thermal barrier coating.
18. An afterburner according to claim 16 wherein said flameholder liner includes a pattern of screech suppression holes therein.
19. An afterburner according to claim 18 wherein said flameholder liner is spaced inwardly from said duct to define a slot for channeling cooling air therethrough for cooling said liner and film cooling said linerless duct portion downstream therefrom.
20. An afterburner according to claim 16 wherein said gutters are integrally formed with said center cup and surrounding liner in a unitary component.
21. An afterburner according to claim 16 wherein said center cup includes a center aperture receiving said fuel injector therein, and a plurality of surrounding slots for swirling engine exhaust therethrough.
22. An afterburner according to claim 21 further comprising a plurality of fuel injection spray bars distributed between said flameholder gutters.
23. A flameholder according to claim 16 in combination with a turbofan gas turbine engine having an outlet aligned with said flameholder for discharging core exhaust thereto, and a surrounding fan bypass duct aligned with said flameholder liner for discharging fan bypass air therearound.

24. An apparatus according to claim 23 wherein:

said engine includes a compressor for pressurizing air, and a controller operatively joined to said fuel injector in said afterburner; and

said controller is configured to schedule fuel flow to said afterburner to match rate of ablation of said inner nozzle upon initiation of afterburner operation to maintain stall margin of said compressor.

25. A method of operating said gas turbine engine and afterburner according to claim 23 comprising:

operating said engine in a dry mode to produce exhaust thrust through said inner nozzle without injecting fuel into said afterburner; and

operating said engine in a wet mode to inject additional fuel into said afterburner for undergoing combustion therein and ablating said inner nozzle to reveal said outer nozzle for producing additional exhaust thrust therethrough.